

INTERNAL OPTICAL FIBER HINGE SYSTEM FOR A CONSUMER ELECTRONIC DEVICE

FIELD OF INVENTION

[0001] The invention relates generally to the field of consumer electronic communications and audiovisual equipment and, more particularly, to a hinge system enabling utilization of optical fibers for greater information transfer rates between the covers and the bases of such devices.

BACKGROUND OF INVENTION

[0002] As of October of 2004, there were an estimated 170 million cellular telephone subscribers in the United States, with double digit growth annually. In addition to cellular telephones and pagers, other portable consumer electronic devices such as video or digital camcorders are also very popular. Because the video screens of the phones and camcorders, as well as the keypads or other controls are susceptible to being damaged, it is known to use a cover or lid that “flips” open about a hinge or slides along the plane of the screen to either reveal or hide the screen. To provide a variety of operable positions, many times the cover encompasses the screen and is capable of pivoting about a second axis usually perpendicular to the axis of rotation of the hinge. The use of a hinged lid also acts to decrease the overall size of the device, thereby making it more portable and appealing for consumers.

[0003] Currently, devices such as cell phones and camcorders usually use electrical flex circuits containing thirty or more copper wires attached together in a harness-like fashion to electrically connect the dial pad/base portions to the displays in such devices. With the ever-increasing need to transmit more data because of, among other things, higher resolution still and video cameras and camera phones, and greater bandwidth available for transmitting data and even video content to phones, conventional copper wires cannot transmit the necessary amount of information at the rate needed. Hence, the need arises to find systems and methods for increasing the capacity and speed of the connections and the information being transmitted.

[0004] While it is known that optical fibers can transmit the requisite amount of information at the desired rate, the operations of the flip hinges, which usually rotate about a substantially horizontal axis and the twisting lids or covers containing the screens that also rotate about a substantially vertical axis, currently make it difficult to insert the optic fiber needed to send more information faster. In particular, glass or plastic fiber can, among other things, break if it is bent too far during operation of the flip and/or twist lid, thereby destroying its ability to transmit information. Therefore, there is a need to produce a system for utilizing optical fiber to transfer data between the base and screen portions of a consumer electronic device such as a cellular or wireless phone or a camcorder containing a hinge assembly or system that enables the device to flip open or closed and/or twist around an axis that is substantially perpendicular thereto so as to overcome these problems.

[0005] The current invention accomplishes the ability to employ the benefits of greater data transfer rates of relatively fragile optic fiber in the environment of consumer electronic devices such as phone and camcorders that allow for flipping

open of the base or keypad relative to the screen, about one axis of rotation—as well as twisting of the screen relative to the base about a second axis of rotation.

SUMMARY OF INVENTION

[0006] The present invention is an improvement over the prior hinged consumer electronic devices such as a phone or a camcorder or a laptop computer in that the way that the hinged device utilizes optical fibers is unique and comprises an improvement over the prior art. One embodiment of the hinge system of the present invention for a cellular flip-type telephone comprises a plurality of substantially rigid tubing members that rotatably fit together in tight, telescopic fashion so as to permit the optical fiber to extend safely between the base and the lid of the cellular telephone. Although the figures and disclosures illustrate various embodiments of the invention in relation to a cellular telephone, the present invention may be applied to a variety of hinged communications and/or consumer electronic devices and is not limited to the specific types of products embodiments shown and disclosed therewithin.

[0007] A first embodiment of the hinge for a flip-type cellular telephone comprises a pair of substantially L-shaped substantially rigid tubing members that form a hollow conduit that extends between the base and the lid to permit an optical fiber to transmit information between respective paired light sources and detectors in the base and lid. This conduit can also serve as the hinge that permits the phone to be flipped open or closed. In particular, the first substantially L-shaped substantially rigid tubing member has a first or lower end that extends into the base and is affixed to the base by brackets, fasteners, gluing, molding or other known forms of affixation. A second end extends substantially along the horizontal flip axis of the phone. The second or upper substantially L-shaped substantially rigid tubing member has a first end that extends into the lid and is affixed thereto, and a second end that extends substantially along the horizontal flip axis and is affixed thereto. The second ends of the substantially rigid tubing members are sized so that one of the ends telescopically fits within the other end in such a way as to allow for rotational movement of the upper rigid tubing member relative to the lower tubing member when the lid is rotated or flipped between an open and closed position.

[0008] If the cellular telephone permits the lid to: (1) be flipped, and (2) twisted about a vertical axis relative to the flip axis, an alternate embodiment of the present invention comprises at least three substantially rigid tubing members that overlap and connect telescopically so as to permit rotation. The tubing members also act to form a conduit that extends between the base and the lid to permit an optical fiber placed therein to transmit information between respective light sources and detectors in the base and lid. In particular, the conduit comprises a first or lower substantially L-shaped substantially rigid tubing member that has a first end that extends into the base of the phone and is affixed thereto. A second end extends substantially along the horizontal flip axis. A second or central substantially L-shaped substantially rigid tubing member has a first end that extends substantially along the horizontal flip axis and a second end that extends substantially along the vertical flip or twist axis. An upper substantially rigid tubing member extends substantially along the vertical flip or twist axis. The ends of the central tubing member and the respective ends of the lower